

**BEFORE THE
PUBLIC SERVICE COMMISSION OF WISCONSIN**

Application of the Milwaukee Water Works
for Authority to Increase Water Rates

Docket 3720-WR-108

**DIRECT TESTIMONY OF CHRISTINE CRAMER
ON BEHALF OF MILWAUKEE WATER WORKS**

1 **Q. Please state your name and business address.**

2 A. My name is Christine Cramer and my business address is 231 East Buffalo Street, Suite
3 306, Milwaukee, Wisconsin, 53202.

4 **Q. Please state your occupation.**

5 A. I am a Principal and founding member of Trilogy Consulting, LLC, providing financial,
6 economic, and planning consulting services to municipal governments and utilities.

7 **Q. Please describe your educational and professional background.**

8 A. I have a Bachelor's Degree in Physics from Carroll University, Waukesha, WI. I have a
9 Master's Degree in Urban Planning from the University of Wisconsin-Milwaukee.

10 I was employed for 14 years by Ruekert/Mielke, Inc. a civil engineering firm
11 located in Waukesha, WI, in the Financial Services department, which later became the
12 Municipal Economics and Planning Division. From 2001-2011 I was project manager for
13 a variety of projects and studies. For water and sewer utilities, I prepared long-term
14 capital improvement funding plans, cost-of-service rate studies, including the design of
15 new rate structures, performed financial analysis in support of utility acquisitions and
16 mergers and contested rate cases, and developed funding mechanisms to pay for water
17 system expansion.

1 In November 2011 I left Ruekert/Mielke to form Trilogy Consulting as a Limited
2 Liability Corporation with Erik Granum and Jonathan Cameron. I have attached a copy of
3 my curriculum vitae to this testimony as Ex.-MWW-Cramer-1.

4 **Q. Has the Milwaukee Water Works (MWW) authorized you to provide testimony on**
5 **their behalf?**

6 A. Yes, it has.

7 **Q. What is the purpose of your testimony?**

8 A. The purpose of my testimony is to provide support for MWW's proposed customer class
9 demand factors used in Schedule 9 of Ex.-MWW-Wright-2 (PSC REF#:205539) which is
10 MWW's Revised Cost of Service Study. Specifically I will describe the methodology
11 used in the Customer Demand Study filed by MWW on May 7, 2014 (PSC
12 REF#:204119).

13 **Q. Are you sponsoring any exhibits with your testimony?**

14 A. Yes. I am sponsoring Ex-MWW-Cramer-2 (PSC REF#:204119), which is the Customer
15 Demand Study filed by MWW on May 7, 2014, which I prepared along with Erik
16 Granum.

17 **Q. Please describe the purpose of the customer demand study.**

18 A. The purpose of this study was to develop appropriate maximum day and maximum hour
19 demand factors based on current demand patterns for each customer class to be used for
20 MWW's cost of service study. The demand factors used for the retail customer classes in
21 Milwaukee's previous rate studies were based on a 1977 study by Black and Veatch. The
22 data that we collected from samples of retail customers in 2012 and 2013 indicated that
23 these 1977 data do not represent current patterns of water demand.

1 **Q. Please describe the general approach used to develop the proposed demand factors**
2 **for the retail customer classes.**

3 A. Since MWW retail customers generally do not have water meters that read and store
4 hourly consumption data, the ratios of maximum daily and hourly demands to average
5 day demands for each class had to be based on a sample of customers in each class. In
6 2012, MWW staff installed meters capable of reading and storing up to 40 days' worth of
7 hourly consumption data on a sample of customers in each retail customer class and
8 collected that data. Additional meters were installed and read in 2013.

9 For each customer class, we were to sum the hourly demands and the daily
10 demands of all of the sampled customers for each hour and day during which we
11 collected data and find the one maximum value during the sample period. The initial
12 intent of the study was to compare the peak usage figures to the annual average usage of
13 the customers in each sample (based on billing records) to determine the appropriate max
14 day and max hour ratios. The data of interest would be the coincident ratios of the total
15 sample for each customer class, not the ratios of individuals in the samples.

16 **Q. Please describe the general approach that was used to select the samples for each**
17 **retail customer class.**

18 A. Our goal was to select a sample from each class with the sufficient size and appropriate
19 composition so that the demand patterns of the sample *as a whole* were as close as
20 possible to the demand patterns of the entire class *as a whole*. The challenge was to find
21 the right mix of sample customers whose highest day demand compared to its average
22 day demand, as a group, is expected to be similar to the highest day demand to average
23 day demand of the entire customer class.

1 In order to determine the appropriate sample size and composition, we conducted
2 a detailed analysis of the monthly or quarterly consumption patterns of all customers in
3 each retail customer class for the years 2007-2011. We calculated the ratios of peak
4 month to average day or peak quarter to average day usage for each customer class and/or
5 each billing group within each customer class and also compared the range and median
6 ratios for the individuals within the customer class to the ratios of the class as a whole.
7 For the residential class, the focus of the historical data analysis was to: 1) confirm the
8 best time of year for sampling, based on the peak quarter of water demand from year to
9 year; and 2) examine the seasonal peak day to average day ratio for the class based on the
10 quarterly water usage data. In addition to the goals identified for the analysis of
11 residential customer data, the analysis of nonresidential customer data was also used to:
12 1) identify those customers that cause the water consumption patterns of that class and/or
13 could be considered a separate customer class; and 2) refine the sampling methodology,
14 and the number and the appropriate mix of the customers to sample. The analysis of the
15 historical billing data is shown in the Customer Demand Study, Ex.-MWW-Cramer-2,
16 pages 9-27.

17 **Q. What were the findings of the historical consumption analysis for the residential**
18 **class and how were those findings used to determine the residential sample?**

19 A. The residential customer class is comprised of a large number of customers with
20 relatively small and fairly homogeneous demand per customer. The demand patterns of
21 the class as a whole are the result of thousands of individual customers' total water
22 demand and ratios of peak demand to average demand, as well as the timing of each
23 individual customer's peak demand. There is not a particular segment of the class whose

1 demand patterns drive the demand patterns of the class as a whole. We did, however, find
2 some differences in demand patterns in different geographic areas of the retail service
3 area, as identified by the three major billing groups. Billing Group 1, which has relatively
4 low quarterly peak-to-average demand ratios, is primarily located in the central portion of
5 the City of Milwaukee and includes retail customers in the Village of West Milwaukee.
6 Billing Group 2, which has generally higher peak-to-average quarter ratios, consists
7 primarily of areas on the south side of Milwaukee and the suburban retail customers of
8 Greenfield, Hales Corners and St. Francis. Billing Group 3, which includes the north
9 central, north and northwest portions of Milwaukee, had varied peaking ratios among its
10 billing subgroups.

11 Based on these observed patterns, we determined that the sample of residential
12 customers should include customers from meter reading routes in each of the three major
13 billing groups. Four meter reading routes were selected at random from each of the three
14 major billing groups. Housing and socio-economic data from the 2010 Census was used
15 to verify that the selected routes are representative of the retail service area in terms of
16 housing stock and key socio-economic characteristics. A group of thirty customers was
17 randomly selected from each of the twelve routes. We reviewed the historical water usage
18 for each of the selected accounts to eliminate unusable accounts and evaluate the
19 adequacy of the sample size. The sampling methodology for residential customers is
20 detailed in the Customer Demand Study, Ex.-MWW-Cramer-2, pages 28-30.

21 **Q. What were the findings of the historical consumption analysis for the commercial**
22 **class and how were those findings used to determine the commercial sample?**

1 A. Commercial customers are diverse in terms of total consumption per customer and the
2 degree of seasonal variation in consumption. We found that the consumption patterns of
3 the large number of small customers appear to drive the peaking patterns of the class as a
4 whole, while the largest customers (those billed monthly) differ from the rest of the class.
5 Therefore it was determined that the sample should be comprised primarily of the smaller
6 customers billed on a quarterly basis with a smaller number of larger customers (billed
7 monthly), in proportion to the percentage of quarterly billed and monthly billed
8 customers in the population.

9 We tested this assumption by computing the coincident ratio of peak quarter to
10 average day consumption for the years 2007-2011 for five random samples of 200 non-
11 residential customers. The random sampling resulted in varying numbers of commercial
12 customers and different proportions of those billed monthly versus quarterly. In looking
13 at the specific customers that were sampled in this comparison, we noticed that the key
14 factor in determining the entire sample's peak quarter ratio was the specific mix of
15 customers and their water consumption patterns. A large customer impacts the results of a
16 sample disproportionately to its impact on the entire utility commercial class. For this
17 reason, a sample was taken that mirrors the entire class as much as possible in terms of
18 the proportion of larger versus smaller customers. The sampling methodology for
19 commercial customers is detailed in the Customer Demand Study, Ex.-MWW-Cramer-2,
20 pages 31 and 33.

21 **Q. What were the findings of the historical consumption analysis for the industrial class and**
22 **how were those findings used to determine the industrial sample?**

23 A. The peak month or peak quarter to average day ratios for the industrial customer class are
24 largely determined by those customers billed monthly, and, within that subset group, the

1 very largest customers that are billed monthly. These 51 largest customers represent
2 approximately 78 percent of the consumption for the industrial class. The utility
3 identified 40 of these customers with meters capable of having Encoder Receiver
4 Transmitter devices (ERTs) installed. Also referred to as Endpoint or MIU (meter
5 interface unit) ERTs are communication modules that fit on electric, gas or water meters.
6 The ERTs encode consumption and tamper information from the meters and
7 communicate the data to Itron data collection systems including Handhelds, Mobile AMR
8 and Networks. The sampling methodology for industrial customers is detailed in the
9 Customer Demand Study, Ex.-MWW-Cramer-2, page 31.

10 **Q. What were the findings of the historical consumption analysis for the public**
11 **authority class and how were those findings used to determine the public authority**
12 **sample?**

13 A. From the historical consumption data, it appears that the larger customers in the public
14 authority class tend to exhibit similar peak quarter-to-average day consumption ratios as
15 compared to the remainder of the customers, for both the customers billed monthly and
16 those billed quarterly. These larger customers make up just under half of the consumption
17 for this class. Since the largest customers in this class drive the patterns of peak
18 consumption of the class as whole, it was determined to sample as many of these large
19 customers as possible. The utility initially identified 17 of these customers with meters
20 capable of having ERTs installed. The sampling methodology for public authority
21 customers is detailed in the Customer Demand Study, Ex.-MWW-Cramer-2, page 32.

22 **Q. How did the actual sample of customers in each retail class compare to the selected**
23 **sample?**

1 A. Due to multiple obstacles in obtaining, installing and reading the equipment needed to
2 record hourly usage data, the actual sample sizes were smaller than initially planned for
3 all classes except Public Authority. Of the 332 residential customers initially selected,
4 sample data was obtained for 99 meters in fall of 2012, 101 meters in spring of 2013 and
5 185 meters in summer of 2013. Within the commercial customer class, data was obtained
6 from 71 meters in fall of 2012, 72 meters in spring of 2013 and 90 meters in summer of
7 2013. Data was obtained for 11 industrial meters in fall of 2012, 12 meters in spring of
8 2013 and 35 meters in summer of 2013. For the Public Authority class, data was obtained
9 from 18 meters in fall 2012, 8 meters in spring 2013 and 26 meters in summer 2013.

10 **Q. What was determined to be the best time of year to collect sample data?**

11 A. For all classes except Public Authority, the peak seasonal usage typically occurs in the
12 third quarter of the year (June, July and August). For the Public Authority class, periods
13 of high usage sometimes occur in the second or fourth quarters. The intent was to capture
14 a sample period that encompassed at least June through September or October. The
15 discussion of planned sampling periods is detailed in the Customer Demand Study, Ex.-
16 MWW-Cramer-2, pages 28-32.

17 **Q. How did the actual sample period compare to the proposed sample period?**

18 A. Rather than one sample period spanning from June through October in a single year, data
19 was collected for three distinct sample periods of roughly one month each, in
20 October/November 2012, April/May 2013 and July/August 2013.

21 **Q. Did these changes in the sample size and the sample period result in changes in the**
22 **way the data were analyzed to determine the customer class demand factors?**

- 1 A. Yes, we did analyze the data differently than originally intended, developing demand
2 factors that are based on the sample data, adjusted for long-term average seasonal
3 peaking factors for each class. Mr. Granum will address the details of that analysis in his
4 testimony.
- 5 **Q. Does this conclude your testimony?**
- 6 A. Yes, it does.